The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Structural Plastics

FROM the day in 1908 when Dr. Baekeland discovered the phenolic resins and introduced Bakelite to the world, until this present year of grace, it is probable that in no other group of chemical products has there been so widespread and intense research as in regard to plastics. No other branch of chemical industry has had so great a share of public attention, probably because its mushroom growth has focussed attention upon it, not only in the popular but also in the technical press. New industries of this character thrive by publicity—what industry does not?—and undoubtedly the salesmanship of the industry has matched the skill with which its chemists have modified their products to fit new uses and to fulfil new demands. Plastics have been described as the successor of iron and steel, and quite exaggerated hopes or expectations have been built upon the supposition that this generation is seeing the Steel Age pass into the Plastics Age. The steel industry, of course, has not been idle and has met the challenge, if challenge be the right word, by discovering new alloys, and by bringing on to the market a host of new steels that enable the designer to achieve results never before thought possible. Heat-resisting steels, stainless and corrosion-resisting steels, steels for hard abrasive duties and for countless other new uses have been made available. In the race between steels and plastics, the scientific workers have achieved great advances in both industries, so that those who were disposed to predict the passing of the steel industry have to-day even less substance for their predictions than they ever had.

The truth of the matter is that plastics and steel are largely complementary, not competitive. There are uses for which one is better fitted than the other; there are uses for which only one is fitted; there are some uses in which a certain competition may be discerned. Both the limitations and the uses of plastics were to some extent disclosed in a paper upon this subject which Mr. H. V. Potter recently contributed to the Royal Society of Arts.

It is of interest to observe how often the chemist is now required to build up large molecules. The synthetic production of lubricating oils is one instance of this; plastics is another. Only when the modern resinoid plastics of the phenol-formaldehyde type and later of the urea-formaldehyde type were developed was there any plastic with enough mechanical strength and other needful physical properties to be of practical value to the engineer. A peculiar property of resins is their ability to be moulded when hot and to set hard on cooling, these thermosetting resins being of inestimable value for certain types of constructional work. Modern work has shown that long-chain molecular structures are often plastic; zig-zag long-chain structures are present in elastic bodies, such as rubber, while a ring or network structure produces a material no longer plastic but hard and rigid, as in the hardened phenol resinoid. The intensive investigation that has been given to this subject has enabled substances to be prepared whose properties can be predicted in advance with reasonable accuracy, and considerable future developments are predicted as the result of the commercial development of the large molecules. When these substances are combined with fillers, important engineering materials are developed.

Among the limitations of plastics is inability to withstand heat. Since heat is generated frequently in mechanical engineering, this is a limitation of some importance. They cannot at present be used as main building materials because, although on a weight-strength basis, they compare favourably with metals and wood, they are more costly, especially since in order to obtain the same strength as against steel, the equivalent weight would require a very large bulk of plastic material. For motor-car work and aeroplanes plastics find many valuable applications, as can well be imagined, and in many industries it is in decoration and for internal fittings, etc., that these materials are being used.

The uses of plastics in chemical engineering are growing because of their inertness to many corrosive substances. They are competing here with metal, wood, glass, rubber and ceramics. They are used extensively in the construction of dye vats, pumps, valves, washers, for towers up to 40 ft. high in sections, for rectangular tanks up to 60 ft. long in 10 ft. sections, while cylindrical tanks 9 ft. in diameter and 7 ft. deep have been made. Conveyors may be made with a protective plastic coat, and there is even a conveyor with plastic links having the dual advantages of absence of corrosion and absence of contamination from the material carried. Sheet phenolic resinoid is used in the construction of plating barrels, these being harder wearing on the surface, non-absorbent and resistant to the electrolyte contained in the barrels. New chemical-resistant paints and varnishes based on 100 per cent. phenolic resinoids are now used wherever maximum life of the varnish film is required against corrosive conditions. This might be a solution of the difficulty of constructing laboratories of materials that will not be affected by the fumes which the chemist delights in generating therein.

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NOTES AND COMMENTS

The Holiday Month

THE importance of the chemical industry to the national war effort being what it is, it is improbable, to say the least of it, that chemical workers will enjoy their usual holiday this month. The willingness of workers of all grades to forgo their customary spells of leisure has, indeed, been one of the most heartening features of this troubled year, and one of the best auguries of ultimate victory for the cause of civilisation. At the same time, there is such a thing as working a willing horse to death, and Mr. Bevin and Mr. Morrison, having succeeded in speeding the tempo of war production to an almost unbelievable extent, have shown their wisdom in relaxing the strain as soon as the most immediate and urgent national needs had been secured. Long hours do not mean increased production if they are kept up for too protracted a period, and the optimum length of the working day, from the production point of view, varies with circumstances. The industrial psychologists, indeed, have worked the problem out with care and skill. Now that August, the normal holiday month, is upon us, it will be universally agreed that the total stoppage customary on the first Monday of the month must be avoided at all costs; but at the same time a period of relaxation should be given to every worker that can be spared, with a view to keeping up his capacity for production in the grim winter that lies in front of us all.

Black-Out Lighting in the Factory

THE effect of black-out conditions on the lighting of factories has been studied by a departmental committee, of which Sir Duncan Wilson, Chief Inspector of Factories, was the chairman. A principal recommendation is that the standards of lighting (which are expressed in terms of foot-candles at a stated height from the floor) should ensure that conditions in all factories in which overtime or night-shifts are carried on are comparable with those of a well-lit living room. To make the best use of lighting, walls, partitions, ceilings, and interior surfaces of windows and roof lights (through which the passage of daylight is prevented) should be light in colour. The committee also recommends the limitation of glare from all general lighting units less than 16 ft. above floor level, the complete screening of local light sources, and the prevention of reflection of light from smooth or polished surfaces into the eyes of the worker. Measures should also be taken to prevent shadows which interfere with safety and comfort. Two features of industrial work in a large number of factories at the present time are, the report says, high pressure, with much greater strain on the worker, and a far longer time spent under artificial light. The committee has not found evidence that prolonged or even continuous work under artificial light has any deleterious effects upon health or safety, but present conditions of work in many factories are unnatural and new to the majority of workers, and exposure to such conditions justifies the maintenance of a higher standard of lighting than had been previously recommended.

Anthracene Supplies

EXAMPLES of the invaluable manner in which trade associations have assisted their respective industries to cope with the numerous regulations and difficulties occasioned by the advent of war were provided in the speech of the chairman of the Colour Users' Association, Mr. N. G. McCulloch, delivered at the annual meeting in Manchester last week. Mr. McCulloch explained how the knowledge and experience of certain members of the Association had enabled various aspects of governmental control of the dyestuffs industry to develop on reasoned lines. Of particular interest were his references to sources of supply and in this connection it is worth while noting his remarks on anthracene. When the war started, supplies of anthracene made in this country were only equal to 60 per cent. of the normal requirements of the colour makers, the balance having been imported from abroad. The unexpectedly heavy demands for vat colours for dyeing material for service uniforms, particularly for khaki, increased these requirements. The situation was pointed out by users and makers, both collectively and independently, but little progress was made. After repeated efforts a departmental committee under the Ministry of Mines was set up and a comprehensive inquiry made among the gas and coal tar industries. It was found there was a potential supply six or seven times greater than the existing one. It was also found that quantities of anthracene were being produced, but containing paraffins which made it unsuitable for use by colour makers. Professor Kenner, said Mr. McCulloch, showed that this difficulty could be overcome, but the Metropolitan Gas Company were independently able to give a large-scale demonstration of a method of purification. Their public-spirited action in this matter had thrown open the way to a solution of the problem and there was now every probability that the supply of anthracene for colour making would shortly be equal to three times the amount available less than twelve months ago, an amount, in fact, sufficient to keep the extended plant of the colour makers fully occupied. As Mr. McCulloch pointed out, the case of anthracene draws attention to the necessity of dealing with the manufacture of intermediates in this country. Out of the necessities of the last war a great colour and chemical industry was built up. Colour makers cherish the hope that out of the necessities of this war the intermediate industry will similarly be set on its feet.

Metal Coatings on Aluminium Alloys

According to Ital. Pat. 368,331 (L. Perner) articles of aluminium or its alloys acquire a protective coating when dipped in a solution containing a metal fluoride or silicofluoride, or a borofluoride, in presence of an organic colloid. A typical solution is prepared by mixing a nearly saturated solution of cadmium silicofluoride with 4-5 times its weight of water and adding 2-5 parts per thousand of an organic colloid like albumen or dextrine. Treatment is effected by dipping for 5-10 minutes.

Organic Phosphates in Industry

Some Technical Applications

by LOUIS LIGHT, Ph.D.

IN the field of lacquers and plastics the demand for plasticising agents for cellulose esters was originally responsible for the large-scale manufacture of triphenyl phosphate and tricresyl phosphate, and these are still the organic phosphates in most extensive use. Triphenyl phosphate is largely used in the manufacture of cellulose acetate cinema film, while tricresyl phosphate is one of the few plasticisers in standard use in the nitrocellulose lacquer industry. Several other phosphates offer special advantages and are used to a more limited extent. Tributyl phosphate, for example, does not discolour on prolonged exposure to sunlight and is consequently superior to tricresyl phosphate in clear or white nitrocellulose and cellulose acetate finishes. Chlorine-containing phosphates are outstanding as flame-resisting plasticisers. The chief member of this group is dichloroethyl phosphate (Cetamoll Qu) which has been shown in recent tests to be the best flame-proofing plasticiser for nitrocellulose lacquers. The next in order of value were tricresyl phosphate, triphenyl phosphate and tributyl phosphate. Cetamoll Qu also imparts exceptional flexibility to aircraft dopes at very low temperatures. Trichloroethyl phosphate has been used in nitrocellulose, ethyl cellulose and cellulose acetate compositions. Tributyl phosphate is an exceptionally good plasticiser for the hard lac resin now extracted from shellac. Tricresyl phosphate has been used as plasticiser for rubber-like polyvinyl chloride plastics (*e.g.*, Koroseal).

New Plasticisers

A series of new phosphate plasticisers recently introduced to cater for the special requirements of ethyl cellulose compositions include such complex substances as diphenyl-mono-(*o*-xenyl) phosphate, di-(*o*-xenyl)-monophenyl phosphate, and tri-*para*-tertiary butyl phenyl phosphate. They are generally superior to triphenyl and tricresyl phosphates in respect of light-fastness, flame-resistance, electrical properties and moisture permeability. They yield harder but more flexible films and coatings with ethyl cellulose, polystyrene and vinyl ester resins than the phenyl and cresyl compounds, and are less toxic.

Brief reference may finally be made to less well-known plasticisers such as mixed glycol phosphates (*e.g.*, dimethyl glycol butyl phosphate for cellulose acetate), and triresorcinol phosphate (fireproofing plasticiser for nitrocellulose).

Among the phosphate resins, products in course of development are the allyl and methallyl phosphates which form copolymer resins with styrene. Ordinary polystyrene resins have a tendency to blush and craze, while their ease of solubility in benzene is not always desirable. All these drawbacks can be eliminated by copolymerisation with 5 to 10 per cent. of triallyl phosphate, methallyl diphenyl phosphate, trimethallyl phosphate, monoallyl-di-(*o*-xenyl) phosphate, etc.

Textile Applications

Organic phosphates are effective as insect-proofing agents on fabrics. Aryl phosphates recommended for the mothproofing of woollen fabrics include phenyl-di-(*o*-xenyl) phosphate, a white water-insoluble powder with an unobjectionable odour. The flame-proofing properties of complex phosphates have already been noted in connection with cellulose ester and ether lacquers. Viscous assistants for wool dyeing (and leather greasing) have been prepared by reacting a polymeric metaphosphoric acid with a long-chain hydroxy compound, *e.g.*, anhydrous hexametaphosphoric acid and castor oil. Other suggested textile assistants are the esters of orthophosphoric acid with mixed long-chain alcohols, *e.g.*, lauryl myristyl phosphate. The sodium salts of these esters are excellent emulsifying agents for oils. Tricresyl phosphate has been recommended as a lubricant during the knitting of threads made with rubber latex.

Glycerine monophosphoric acid (made with metaphosphoric acid) finds extensive employment in medicinal and dietary preparations (nerve tonics and stimulants) especially in the form of its sodium, calcium and quinine salts. The natural phosphatides (*e.g.*, lecithin) are essentially choline salts of higher fatty acid esters of a monoglycerophosphoric acid.

In the gas-manufacturing industries some importance has been acquired by tricresyl phosphate as a scrubbing agent. It has unusual absorbent power for phenolic bodies and its low volatility makes it economical in continuous operations. The same ester has been put forward as a lubricant in oxygen-compressing plants where, unlike ordinary hydrocarbon lubricants, it does not form an explosive mixture with oxygen. The inertness and high boiling point of tricresyl phosphate, coupled with its relative cheapness, have in fact led to its adoption as a component of a variety of packing and caulking preparations and the like. Other suggested uses are the anti-termite impregnation of timber in the tropics and the fire-proofing of rubber.

Triethanolamine phosphate inhibits the corrosive action of ethylene glycol when used as an antifreeze liquid. An aqueous solution of triethanolamine phosphate itself has been proposed as an anti-freezing liquid in place of ethylene glycol. A solution of 1 to 3 per cent. ethyl cellulose in an aryl phosphate, such as diphenyl-mono-(*o*-xenyl) phosphate, forms a sticky gell when cold, but is perfectly fluid at a moderate temperature. Such compositions have been found exceptionally useful as dust collectors when applied to the fibrous filter beds of air-conditioning plants. The addition of ammonia and a small percentage of tricresyl phosphate to carbon tetrachloride is reported to cut down the risk of phosgene production when used as a fire extinguisher. Phosphoric esters are also claimed to improve the fire-extinguishing efficiency of carbon tetrachloride. Differences in water-solubility of the dimethyl phosphates of rare metals have been exploited in the purification of terbium, dysprosium and holmium.

PHOSPHATE FILM FOR FOOD CONTAINERS

American consular reports, quoted by *World Trade Notes*, announce that a new type of can container for packing food products, dispensing with the use of tinplate, has been developed in Germany. Instead of tin for coating the iron, the base sheet for making the new cans is coated with a phosphate film applied by the Bonder phosphate rust-proofing process, controlled by the Metallgesellschaft A.G. of Frankfort-on-Main. Instead of being soldered, the new type of can is welded by special automatic machinery, effecting a saving of 2 per cent. in can material. By the Bonder process a thin uniform phosphate film is placed on the sheet in two or three minutes by immersion in a special phosphate bath. The entire production process requires 30 minutes. This new type of container is suitable for packing all kinds of food except acid-containing products like fruits. However, it is believed in German circles that it can be rendered suitable for fruits also by the application to the inner surfaces of the container of a special acid-resisting lacquer film.

THE DEPENDENCE OF JAPAN upon imported apatite for superphosphate manufacture may be reduced by the discovery of extensive deposits in two areas. One of these, estimated to amount to 100 million tons, is in the Tansen region of Korea: the other is at Gyooku on the island of Kaji. A company with a capital of 346,000 yen has been formed to develop the latter.

LETTER TO THE EDITOR

Increased Welding Production

SIR,—At the present time there are between 30,000 and 40,000 arc welding machines in use in Great Britain, almost all of them being used exclusively on Government and armament contracts. Many letters have appeared in the Technical Press from prominent industrialists bemoaning the fact that machine tools are not working twenty-four hours a day. This contention undoubtedly applies also to welding machines, which are, of course, a form of machine tool.

However, a case for much more serious concern at the present time, is the fact that during the hours that arc welding machines are used, they are almost invariably not being used to their full productive capacity. This Foundation has been endowed to promote knowledge of welding and we would recommend every engineer who uses arc welding to give serious consideration to the following points:—

(1) A welding operator seldom has his arc burning for more than four hours out of every eight. The operator spends the remaining four hours cleaning his welds, assembling the job to be welded, tacking, and doing other work which could be done by unskilled labour.

(2) Welding electrodes are seldom run at maximum currents. The rate of melting of the electrode increases as the welding current increases and welding currents can frequently be increased 10 per cent. or 20 per cent. and can often be increased 30 per cent. or 40 per cent., thereby giving a greater arc of welding.

(3) Work is all too frequently welded with 5/32 in. electrodes where a 3/16 in. electrode could be used, or a 3/16 in. electrode is often used where a 7/32 in. electrode could do the job. By using a larger electrode a weld joint can be made much more quickly, because welding is a matter of depositing metal, and it is sound economics and good engineering to use the largest electrode and the highest current possible on every job

(4) By the use of jigs, fixtures, and manipulating devices for turning jobs in course of being welded, the time the arc is in operation can be increased still further by turning work so that the operator is welding in the flat position, instead of in the vertical or overhead position.

We have no hesitation in stating that if engineers who control welding operations were to give some consideration to the points mentioned above, the production of welded work could be increased by at least 10 per cent. and in many cases increased by 30 or 40 per cent. If only 10 per cent. increase were secured, it would mean 3000 or 4000 welding machines released for productive work, instead of running idle, and a like number of skilled welding operators released. Quite apart from the above question of increasing welded production, considerable quantities of steel can be saved by redesigning existing machinery and armaments, so that such machinery, etc., can be fabricated by welding. It is quite common for machinery redesigned for fabrication from welded steel to show a saving of between 10 and 20 per cent. of the weight of steel required as compared with other methods of construction.

This Foundation is again offering £40,000 as prize money for engineers who devote time and study to this question of the correct use of welding and obtaining the full benefits from welded fabrication. This prize money was endowed before the war started, but to-day it is doubly important that engineers give attention to these matters as part of the national effort.—Yours faithfully,

THE JAMES F. LINCOLN ARC WELDING FOUNDATION.
R. BUTLER, British Representative.

Welwyn Garden City, July 24.

THE OFFICIAL JAPANESE IMPORT STATISTICS show receipts of sodium nitrate during the first quarter of 1940 at 108,766 metric tons, as compared with 6585 during the corresponding period of 1939.

New Control Orders

Protection for Small Firms

CONTROLLED small businesses whose trade has been restricted by the Limitation of Supplies (Miscellaneous) Order are to be protected from possible development of unfair competition from new businesses. The Order has been amended by the Board of Trade to require any person establishing a new business, however small, to apply for registration. Exception is permitted only in cases where an existing non-controlled "small" business, established before this week, is taken over by a person who has not previously carried on such business.

Export of Tartrates, Nicotine, etc.

The Board of Trade has made the Export of Goods (Control) (No. 27) Order which came into force on August 1. In addition to the prohibitions already in force against the exportation of all goods to certain destinations, under the provisions of this Order it is prohibited, except under licence, to export soap of all kinds to certain other destinations; portable metal gas cylinders, filled or unfilled, to all destinations; argol and other crude tartrates and tartaric acid and its salts, excluding potassium antimony tartrate, to all destinations outside the British Empire; and nicotine and nicotine sulphate to all destinations.

Tins and Cans

The Control of Tins and Cans (No. 1) Order, 1940, published on July 20 by the Minister of Supply and prohibiting the use of tinplate and sheet in the manufacture of containers for certain commodities, does not affect the chemical industry very extensively. It may be noted, however, that the use of tinplate containers is prohibited for seidlitz powders, strychnine, borax powder, liquid soap, and petrol, and that approved sizes of tins are listed for oils, paints, and general chemicals. Copies of the Order may be obtained from H.M. Stationery Office, price 2d. (post free 3d.).

Imports of Talc

The Board of Trade announces that from July 25 until further notice the open general licence authorising the importation of the following goods from all countries has been revoked and individual licences will be required: talc, steatite and soapstone, ground and unground, including French chalk and asbestine. Individual licences will not be required for any such goods proved to the satisfaction of H.M. Customs and Excise to have been despatched before July 25 and which are imported into the United Kingdom before September 25, 1940. Applications for licences to import such goods should be made to the Import Licensing Department. Forms on which the applications should be made are obtainable from the Import Licensing Department or from the offices of Collectors of H.M. Customs and Excise.

Chemical Matters in Parliament

Iron-Ore Deposits in Cumberland

THE Minister of Supply was asked in the House of Commons last week by Mr. Nunn, what steps were being taken to make the fullest possible use of the Cumberland iron-ore deposits. Mr. Herbert Morrison replied that a number of special surveys and borings had been made since the outbreak of war, as a result of which steps were being taken to open up certain new or disused workings as soon as possible.

EXPORTS OF SODIUM CARBONATE from the famous "soda lake" of Magadi, Kenya, operated by the Magadi Soda Company, Limited, a subsidiary of I.C.I., Ltd., rose from 29,246 tons, valued at £132,843, in 1938, to 40,983 tons, valued at £186,477, in 1939.

Personal Notes

MR. R. T. HOLDER, who represents Imperial Chemical Industries at Kobe, was one of the prominent British residents detained by the Japanese authorities on July 27. He has, however, since been released.

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MR. ARTHUR J. MEARS, M.A., B.Sc., Senior Chemistry Master at King Edward VI School, Birmingham, has been appointed Experimental Officer in the Chemical Inspection Department, Ministry of Supply.

* * * *

MR. P. H. WILSON, member of the executive committee and chairman of the A.R.P. committee of the British Cast Iron Research Association, has been appointed assistant managing director (technical) of the Stanton Ironworks, Ltd.

* * *

MR. G. W. DUNKLEY, of the Iraq Petroleum Co., has been appointed by the Secretary of State for War to serve on the "anti-red-tape" Standing Committee, under the chairmanship of Sir James Grigg.

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DR. J. E. HURST, chairman of the research committee of the British Cast Iron Research Association, and the director, MR. J. G. PEARCE, with MR. E. W. CURRIE and DR. A. B. EVEREST, have been invited to form an advisory committee to the Director of Iron Castings in the Iron and Steel Control of the Ministry of Supply.

* * *

Medals of the O.B.E. (Civil Division) were presented last week to MR. HUGH BURNS, MR. EDWARD SOLLIS and MR. WILLIAM THOMAS JOHN WEST, for their bravery in staying at their posts when an explosion occurred at a South of England gunpowder factory. One building of the factory was extensively damaged, the roof falling in and injuring Mr. Burns, who was in charge. He extricated himself and set about making half a ton of nitro-glycerine safe. In another building that was damaged Mr. Sollis and Mr. West made safe a ton of the explosive on which they were working. What might have been a much bigger explosion, causing loss of life and loss of production, was averted by their gallantry.

OBITUARY

MR. WALTER UNSWORTH SHAW, chief draughtsman at the Deighton works of I.C.I. (Dyestuffs), Ltd., died recently, aged 49.

* * *

MR. ALBERT JOHN BULLEN COOPER, Ph.C., who died last week at South Kensington, S.W.7, was a Fellow of the Chemical Society. He was elected in 1898.

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MR. CHRISTOPHER MEAKINS, who in 1901 opened a chemical research laboratory in Orrel Road, Wigan, died recently on his 75th birthday. In 1919 he went to America to inspect New York laboratories, but on his return six months later he declared that he learned more in England in a month than he could ever learn in the U.S.A.

* * * *

DR. MAX WYLER, who died last week at Manchester at the age of 69, had been for 33 years a distinguished research chemist in the dyestuffs group of Imperial Chemical Industries, Ltd. Educated at the Zurich Polytechnic, he came to England in 1907, after spending some years in the Swiss and German chemical industry, to join the firm of Levinstein, Ltd., at Blackley, Manchester. He became a departmental manager in 1914 and played a conspicuous part in the development of manufacture during the difficult war period. Dr. Wyler reached the retiring age in November, 1932, but joined the research department and subsequently made many important contributions to the achievements and discoveries of the dyestuffs industry in this country.

NEW INTERMEDIATES

Derivatives of oxybutyric acid synthesised by the process disclosed in Ger. P. 686,701 of the I.G. are useful as intermediates for dyes and medicinal agents. The method involves reaction of an aromatic amine with epichlorhydrin. In one example 135 parts of N-ethyl-*m*-toluidine dissolved in 120 parts methyl alcohol were reacted with 97.2 parts of epichlorhydrin. A further 40 parts methyl alcohol were added, together with 16.3 parts sodium cyanide and the mixture heated in an autoclave for 8 hours at 110° C. The salt deposit was separated off and the methyl alcohol solution evaporated down. The residue was refluxed with 535 parts hydrochloric acid (d 1.19) for 90 minutes, then rendered alkaline with caustic soda and the alkali-insoluble portion extracted with ether or benzene. The remaining alkali solution was finally neutralised with hydrochloric acid to give a neutral solution of the sodium salt of γ-(N-ethyl-*m*-tolylamino)-β-oxybutyric acid.

CHEMICAL MANUFACTURERS' DIRECTORY

The seventy-second edition of this handbook, dated July 1940, has now made its appearance. It maintains the usual compact and handy form and the 185 pages are arranged in the simplest possible manner for quick reference. A classified list of industrial chemicals, with their manufacturers in this country, is followed by a list of the manufacturers themselves with their addresses, etc., and the products that they supply. The directory does not claim to be absolutely complete, as it depends for its sources of information on the manufacturers themselves, not all of whom have seen their way to supply the requisite data; but as a book of reference it should find a place on the shelves of every user of industrial chemical. It is published at 21 City Road, London, E.C.1 (price 4s. 6d., post free 4s. 10d.), and is obtainable from any bookseller.

British Chemical Prices

Market Reports

A FIRM tone prevails throughout the general chemical market and most sections report a steady flow of buying orders covering spot or near-by requirements. Home makers' deliveries are reported to be satisfactory and the supply position of a number of imported chemicals is by no means acute. Dealers report a fair inquiry for borax, acetic acid, formaldehyde and lead oxides. Offers of cream of tartar and tartaric acid are reported to be commanding higher prices at £7 7s. per cwt. and 1s. 10½d. per lb. respectively. There has been little movement of any importance in the market for coal tar products, and prices continue to be quoted within narrow limits. A fair export inquiry for naphthalene and carbolic acid crystals is reported.

MANCHESTER.—Although there is a continued good demand at firm rates in the coal-tar section of the Manchester chemical market, fresh inquiry for certain descriptions of materials, including cresylic acid, has continued on quiet lines during the past week and values are rather easy in tendency. With regard to the alkalies and other heavy chemicals, the price position generally is well maintained, though in some quarters demand is said to be on somewhat quieter lines, largely in consequence of slower conditions among Lancashire cotton mills and allied trades.

GLASGOW.—There is no change to report in Scottish heavy chemicals, demand for which continues steadily. As supplies appear to be adequate for most purposes a steady feeling prevails throughout. Despite the European situation, there is no apparent shortage of supplies for which local substitutes cannot be found. Prices remain firm.

Price Changes

Charcoal Lump.—£10 10s. to £14 per ton, ex wharf.

Cream of Tartar.—100%, £7 7s. per cwt., less 2½%, d/d in sellers' returnable casks; imported material would be dearer.

Cresylic Acid.—MANCHESTER: Pale, 99/100%, 2s. 6d.

Naphthalene.—MANCHESTER: Refined, £28.

Pyridine.—MANCHESTER: 18s. to 21s. 6d.

Tartaric Acid.—1s. 10½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. Imported material 2s. 3d. to 2s. 6d. per lb., ex wharf. MANCHESTER: 1s. 9d. per lb.

Vegetable Lamp Black.—£30 to £55 per ton, d/d, according to quality.

General News

WILD-BARFIELD ELECTRIC FURNACES, LTD., announce that from August 12 they will be in their new works and offices at Elecfurn Works, Watford By-pass, Watford, Herts. (Tel.: Watford 6094; Telegrams: "Elecfurn, Watford".)

THE INSTALLATION SCHEME planned for the Dalmarnock Chemical Works of Glasgow Corporation is to be carried out by Messrs. Chemical Engineering and Wilton Patent Furnace Co., Ltd., London, at an estimated cost of £14,409.

THE BURSTING OF A LARGE STEEL DRUM of acid, which fell from a lorry, caused the death of a child at Platt Bridge, near Wigan, last week. The child was being wheeled in a perambulator, with an older brother, by her mother, Mrs. Rachel Reeves, and all three were splashed with acid. They were taken to hospital where Alice Reeves, aged two, died soon after admission; the mother and the other child are suffering from extensive burns.

THE MINISTRY OF SUPPLY has given Imperial Chemical Industries, Ltd., authority for limited quantities of trichlorethylene ("Triklone") to be released to the dry cleaning trade. All orders already placed will be cancelled, and each dry cleaner should now send in fresh orders to the appropriate sales office of Imperial Chemical Industries, Ltd. As supplies are insufficient to meet the full needs of the dry cleaners, the quantities available will be distributed in proportion to each buyer's offtake during 1939.

COMPLAINTS IN A LANARKSHIRE VILLAGE about obnoxious fumes from a coke-oven plant supplying important steel works, led to an admission by the Scottish Department of Health that the grievance existed, but that there was no danger to health. Though in normal times measures would have been taken at once to deal with the nuisance, at present, when steel was so essential to the war effort, the Scottish Secretary had no alternative but to suspend the search for a remedy. The villagers appreciated the position and agreed that it would be impracticable to carry out alterations during the war.

Foreign News

ZINC CHLORIDE IS BEING manufactured, for the first time in Canada, at Hamilton, Ontario.

THE IMMEDIATE CONSTRUCTION of a million-dollar (£250,000) sulphuric acid works in Canada on behalf of the British Government has been announced in Ottawa by the Canadian Minister of Munitions, Mr. C. D. Howe. The works are to begin operations early next year.

CANADIAN INDUSTRIES, LTD., are designing and erecting a new liquid caustic plant at Windsor, Ont., at a cost of about $30,000 to replace the existing plant, which has served its useful life. The construction is being carried out by the company's own maintenance department at Windsor.

QUEENSLAND QUICKSILVER, LTD., has resumed operations on its property at Kilkivan. Ore from the open-cut is being treated in the retort. A new discovery of mercury has been reported 18 miles from the mercury mines near Kilkivan. The ore is very high-grade, surface samples yielding from 2 to 10 per cent. of mercury. The lode is wide but has not yet been opened up.

IN RECENT ANIMAL EXPERIMENTS in German laboratories a number of esters of chaulmoogra oil were tested for their influence upon leprosy. The most promising results followed the use of chaulmoogryl cinnamate, while the ethyl and benzyl esters were less satisfactory. Compounds of chaulmoogra oil with glycerophosphoric acid are also under investigation in this connection, the sodium salt of monochaulmoogroyl-β-phosphoric acid being of particular interest in tests on leprosy-infected rats.

MINERAL PRODUCTION IN SOUTH AUSTRALIA in 1939 reached the record value of £3,357,103, states Dr. L. Keith Ward, Director of Mines, in a review for the second half of 1939. The previous record was in 1938, which was less in value by £389,646. Iron ore was the chief contributor, its yield being 87 per cent. of the total value of mineral produced. Production of barytes of 3825 tons was notably higher than ever before, and appears certain to increase in the future. The amounts of gypsum and salt raised and marketed were almost as great as any quantity previously recorded.

From Week to Week

A FACTORY IN HUNGARY, according to a local correspondent of the News Edition of the American Chemical Society, has begun the production of furfural from powdered maize-stalks under Hungarian Patent 123,312 (March 1, 1940). The raw material is mixed with 1.5 to 2.5 times its volume of water and 2 to 5 per cent. sulphuric or other mineral acid. The solution is heated to 120° to 180° C. at 2 to 10 atm. for 1 to 4 hours, and the furfural is distilled before fermentation to alcohol. Under favourable conditions the yield is said to be from 8 to 9 per cent.

VARIOUS TYPES OF SOLVENTS, which have been manufactured in a comparatively small way, are to be more extensively produced in Australia by the Colonial Sugar Refining Company, Ltd., states a report in *The Industrial Australian and Mining Standard*. The company is reported to have as partners in this concern the British Industrial Solvent Co. and Mr. R. L. Corbett and his two brothers. It is hoped that the extensions to the plant owned by that company will make possible, by the middle of August, the production of certain materials now being imported that are of vital importance to the Defence Department.

Chemical and Allied Stocks and Shares

THE better tendency which developed in the stock and share markets towards the end of last week has not been maintained and movements in industrial securities showed no very decided trend. Government stocks remained firm, however, and in most directions very little selling was reported. The failure of Stock Exchange business to improve was attributed to new developments in international politics and a disposition to await the outcome of the latest news of Anglo-Japanese affairs.

Various shares of prominent companies in the chemical and kindred industries failed to keep best prices touched in the past few days, but were better on balance for the week. Imperial Chemical were around 24s. 6d. and the preference units improved to 30s. B. Laporte were inactive and continued to be quoted at 43s. 9d., while Fison Packard were again 30s., and Goodlass Wall remained at 6s. 3d. Borax Consolidated had a firmer appearance at 22s. 6d., and British Oil and Cake Mills preferred were 32s. 6d. Lever and Unilever improved to 20s. 7½d. and the preference units were more active; the 8 per cents. have improved to 21s. 3d. In various other directions preference shares were in better request in view of the apparently attractive yields offered. Results of Low Temperature Carbonisation created a favourable impression, and although "ex" the dividend, the 2s. units made the better price of 1s. 3½d.

Distillers have been good around 55s. 9d., and United Molasses made the improved price of 20s. Courtaulds' interim dividend was in accordance with best market hopes and the ordinary units moved up to 26s. 9d. xd., but there were few changes among other rayon shares; British Celanese second preference lost part of their recent improvement. Movements in other textile securities were small; the market is hopeful that the forthcoming results of Calico Printers may announce a payment in respect of dividend arrears. Metal Box were lower at 60s. and elsewhere, Stewarts and Lloyds, Dorman Long and Tube Investments lost part of their recent gains. British Match had a fairly steady appearance around 26s. and on balance Dunlop Rubber were higher at 27s., while Triplex Glass 10s. ordinary shares were 18s. 9d. Associated Cement moved up to 52s. 6d. at one time, but later reacted to 51s. 3d. Whereas Barry and Staines were better at 20s. 7½d., Michael Nairn went back to 40s. Turner and Newall were around 54s. and on balance, improvement was shown in British Oxygen, British Aluminium and various other widely-held shares which usually move closely with the general market trend.

In other directions, Greeff-Chemicals Holdings 5s. units remained at par, but were inactive, and Monsanto Chemicals 5½ per cent. preference shares were again 21s. 3d. Cerebos ordinary were marked up and are now quoted at £7, while among other higher-priced shares, Reckitt and Sons were 76s. 3d. Amalgamated Metal Corporation were 12s. 6d., and General Refractories 10s. shares were quoted at 5s. 6d. Blythe Colour 4s. shares were around 6s. 3d. following the announcement that, as it has been decided to await results for the whole year, payment of an interim dividend is to be withheld on this occasion. Pinchin Johnson were a few pence better at 15s. 6d., while International Paint remained at 62s. 6d., but Wall Paper deferred units were 11s. 3d., compared with 10s. a week ago. Boots Drug at 37s. 9d. showed good improvement on balance, and Beechams Pills 2s. 6d. deferred shares were higher at 7s. 6d., while Sangers were 18s.

As was to be expected, the heavy decrease in profits and the absence of a final dividend resulted in a sharp decline in Anglo Iranian, and other oil shares were lower on balance.

Metallurgical Section

August 3, 1940

RECLAIMING NICKEL ANODES BY WELDING

Current Loss Preferable to Metal Loss

by C. C. DOWNIE

THE necessity for economising in nickel has become more acute since war-time conditions arose, and every effort is consequently being made to prevent undue wastage, or loss of time, in recovering all available metal in a condition suitable for industrial applications.

One source of nickel waste is to be found in the scrap anodes that accumulate in nickel-plating baths, which in the ordinary way are sold off to metal refiners for melting down. The result of the electrolysis is that these anodes are corroded to a thin shell, compared with the original full-sized flat plate, and, as they usually have developed some odd shape in the process, they are considered as no longer suitable for plating purposes. Although pure nickel anodes are costly, the same cannot be said of the scrap metal which is usually disposed of for the best price it will fetch. The reason for this is that the process of melting nickel is complicated by the high melting-point of the metal and the need for using specially equipped furnaces. One small metal refiner who undertook this work after the last war installed a regenerative gas-fired furnace, and melted down anodes and other nickel scrap, and had it cast in the form of fresh anode plates. Although apparently simple, this process requires skill and a full knowledge of the physical properties of nickel, because, during melting, the metal tends to absorb oxygen, which is difficult to remove with absolute precision. Details of the methods of introducing magnesium at the final stage before casting have been dealt with elsewhere, and need not be repeated. Should the metal inadvertently contain oxygen, the cast plate would be unsuitable for plating, and as the subsequent corrosion proceeds, the surface presented would be unduly rough. Hence undue resistances would be set up within the plating bath, resulting in current losses similar to those that would obtain if an accumulation of the different scrap anodes connected together were used. This feature was recognised as far back as 1916, when a patent was taken out for protecting a process for utilising scrap nickel anodes by welding. This consisted of uniting a number of scrap anodes to a support, or base anode, by the autogenous welding process, with a view to continuing the useful life of all the metal purchased. On the one hand, the remelting of the scrap by furnace methods provides a plate which at least conforms to the usual dimensions necessary for the bath, whereas the welded metal is apt to be of a crude shape, thus causing a still greater increase in the resistances set up.

Difficulties of Handling Nickel

The welding process, however, holds the great advantage that the electroplater can have his own small welding equipment on the premises and, without an involved study of nickel-casting technique, can reclaim his own metal and put it directly to further use. Welding unites the various scrap parts in a permanent manner in the form of a single anode, and the only difference from working with the usual flat anode plate is that more resistance is offered to the passage of the current. After the last war fairly large accumulations of nickel scrap were available from different munition pursuits, but the "bogey" of having to handle a metal possessing a higher melting-point than that of steel coupled with the fact that nickel if imperfectly handled could run sluggishly, did much to retard interest. The result of this was that great quantities of nickel were transported abroad for treatment.

The welding of nickel for anode purposes differs from some of the established methods of welding in that only the pure metal can be used, since foreign material which would be derived from alloy welding rods and wires would directly introduce impurities to the plating bath. This point is more serious than might be imagined from a cursory consideration, since, for example, should iron be present at the united part, it would be electrodeposited before nickel. The plated section would then not only lack its characteristic bright lustre, but would also be capable of tarnishing, and openly corroding, and, still further, would be unsuitable for any subsequent deposition such as chromium plating on the nickel surface.

Problems of Welding Procedure

On the other hand, the work of welding does not necessitate the care that has to be devoted to uniting sections of tanks and vats where the part has to be filled to an exact predetermined depth, and must not be brittle. Experienced nickel-welders take precautions to see that the metal is not puddled or boiled, as the product is apt to be gassy. In the reclamation of anode scrap, this latter problem differs little from the similar troubles of the metal refiner, and as the united scrap parts will present a roughened exterior in any case, gassy metal is not of the same account. As an example, nickel which has to be laid on in layers that have been allowed to cool does not give so good a weld as when worked continuously, but this again is not of importance. Similarly, pains are taken to see that ordinary nickel welds are indistinguishable in corrosion-resisting properties from the parent metal itself, whilst the welding heat must not induce "weld decay," and the consequent heat treatment that must be applied, but welded nickel anodes do not call for these precautions. The anode scrap is welded to a support or base anode either by means of electric arc, or by the oxy-acetylene method.

With arc welding, the work is made negative, and the pure nickel rod or wire electrode represents the positive, whilst the usual short arc, $\frac{1}{16}$ in. to $\frac{1}{8}$ in. long, is followed. As the scrap anodes usually contain a skin of oxide or sludge, depending on the length of service and the condition of the plating bath, the surfaces to be united should be to some extent prepared by scarfing. Oxy-acetylene welding is also applied in the usual manner, using a filler rod of nickel. Flux-coated electrodes, which are commonly recommended for this work, are not desirable, although the flux possesses sound deoxidising qualities, and fluxes any oxides formed. The reason is that such flux would permeate the subsequent bath, and of the two evils, a loss of nickel is preferable. If the flux could at all times be depended upon to form a reliable slag, which could be chipped off, this would be of little account, but one of the arts in successful nickel electroplating is to employ a perfectly clean bath free from impurities, particularly when the work has eventually to be chrome-plated. Thus the welding of scrap anodes is comparatively simple, although it has to be admitted that it has rarely been carried out in

(*Continued at foot of p.* 62.)

FLUXES FOR SOLDERING

Ideal Requirements—Recent Developments

THE controversial subject of fluxes for soldering is considered in an article by B. W. Gonser, D.Sc., and E. E. Slowter, M.Sc., in the current number of *Tin and its Uses*, the quarterly review issued by The International Tin Research and Development Council, Greenford, Middlesex.

The essential requirement of any flux is that it should aid the solder to wet and adhere to the parts to be joined. This involves removal of any oxide or other surface film to permit that intimate metal-to-metal contact so necessary in making sound joints. In addition, a good flux forms a protective layer over the joint, thus excluding air and preventing further oxidation before the solder solidifies. A number of materials which satisfy these requirements cannot be used in many applications because they are corrosive and gradually destroy the joint or injure the material coming into contact with it, to say nothing of their disagreeable effects on the operator.

The ideal flux should: (1) remove surface films from the work and the molten solder; (2) float upon the molten solder when making the joint to prevent further oxidation and flux inclusions; (3) be applied easily and cheaply; (4) leave no corrosive residue or by-products that will injure the joint; and (5) be non-injurious to materials coming into contact with the joint, non-injurious to flesh, and odourless and fumeless.

Investigators are still searching for this ideal flux. Zinc chloride or mixtures of zinc and ammonium chlorides, which are widely used industrially, satisfy the first three requirements admirably, but do not satisfy the last two. Rosin is a less effective cleansing-fluxing material, yet is widely used because of its non-corrosive, non-injurious nature.

In general, solder flux materials may be classed as inorganic and organic and subdivided into groups, of which typical members are listed below:—

Inorganic Fluxes

Acids: (a) Hydrochloric, (b) hydrofluoric, (c) ortho-phosphoric.

Salts: (a) Zinc chloride (zinc+hydrochloric acid), (b) ammonium chloride (sal ammoniac), (c) zinc-ammonium chloride, (d) miscellaneous, *e.g.*, magnesium, calcium and aluminium chlorides.

Organic Fluxes

Organic acids: (a) Oleic, (b) stearic, (c) palmitic, (d) lactic.

Amines and amides: (a) Aniline, (b) acetamide, (c) ethylene diamine, (d) urea.

Rosin fluxes: (a) Rosin (resin, or colophony), (b) special patented rosin-base fluxes.

Miscellaneous: (a) Naphthalene tetrachloride, (b) mannitol and derivatives.

The inorganic acids and salts are, in general, excellent for eliminating oxide films and exposing a clean, etched metal surface, and are quite stable under soldering conditions, but they are more or less corrosive and any excess should be carefully washed away to prevent subsequent trouble from corrosion. Phosphoric acid is an exception, as in some cases decomposition products are formed which resist further corrosion. The eutectic mixture of zinc and ammonium chlorides (about 3 parts zinc chloride to 1 part ammonium chloride) is particularly useful where a low melting flux is needed, as the mixture melts at 179° C., which is far below the melting point of zinc chloride alone (262° C.). A mixture of 10 parts zinc chloride and one part ammonium chloride is a very popular and widely used flux.

Organic fluxes are, as a class, weaker fluxes than the inorganic acids and salts, and any corrosion products formed are slower in their action. The organic acids are easily decomposed, yet some, like benzoic acid, are quite active for a limited time. Amines and amides are useful for quick spot soldering operations, since they are fairly active and either decompose quickly to comparatively harmless residues or volatilise completely. Rosin, the best known and most widely used organic flux, is only mildly active, but is unusual in leaving a non-corrosive residue which is non-conductive and forms a hard solid shell over the soldered joint, impervious to air and moisture. Some patented rosin-base fluxes attempt to combine the speed of an active acid flux with the protection of a rosin residue. As an example, a rosin flux containing 1.5 per cent. aniline hydrochloride and 1.5 per cent. solvent, such as glycerine or ethylene glycol, is said to release sufficient hydrochloric acid by decomposition to speed the fluxing action yet be comparatively non-corrosive.

Promising New Materials

Among the new fluxes which show promise are mannitol, sorbitol and soluble derivatives of these materials. Mannitol is insoluble in most common organic solvents, but can be used as a suspension or as a solution of one of its derivatives. Its non-corrosive, non-toxic nature is very desirable for some applications. Laboratory tests indicate it to be more effective in general than most other organic fluxes, but less effective than zinc chloride. Some work has been done on the use of vapour fluxes such as hydrogen chloride, but they have not yet proved to be economically feasible. Of real practical importance, however, is the use of organic wetting agents to increase the wetting power of solder fluxes. This has formed the basis of many patent and secret-formula fluxes.

Various considerations determine the choice of flux for commercial soldering operations. A strong flux, like zinc chloride, is used for many purposes such as dip soldering of radiator cores, and bit soldering of metals. Rosin is used in the electrical industry and can-making industry for joining tinplate, copper connections, etc. Tallow has a time-honoured record for fluxing lead joints, block tin and pewter. Hydrofluoric acid is sometimes necessary to flux cast iron. A saturated solution of zinc chloride in 50 per cent. HCl is recommended for soldering stainless steel, nickel, and monel metal.

By the choice of suitable solvents or carriers most of the inorganic and organic fluxes may be prepared in cake, paste or liquid forms or as a core within solder wire. Commercial paste fluxes commonly consist of zinc chloride as an emulsion in vaseline or similar grease. Frequently solder powder is suspended within the flux in a grease or paste medium.

JAPANESE IRON AND STEEL

Owing to the rising cost in Japan of imported materials, particularly scrap iron, the official price of iron and steel products is to be raised as from the middle of June, according to trade reports. It is stated further that the Government had considered subsidising the iron and steel industry in order to prevent the necessity of increasing prices, but as between 200,000,000 and 300,000,000 yen was required, the scheme was abandoned in favour of a rise in official quotations. Reports indicate also that the Government will insist on a further reduction in dividends of iron and steel companies.

NEW NICKEL DEPOSIT

The most important nickel deposits in the United States, according to a Reuter report, have been discovered in a remote section of N.W. Arizona, near Littlefield, Arizona. According to an announcement by the Arizona Mineral Resources Board the deposit extends for twelve miles and varies in width between 600 and 1400 ft. Surface samples show a nickel content of 0.68 per cent. with a by-product of platinum with a value estimated at between $1.50 and $3.50 per ton.

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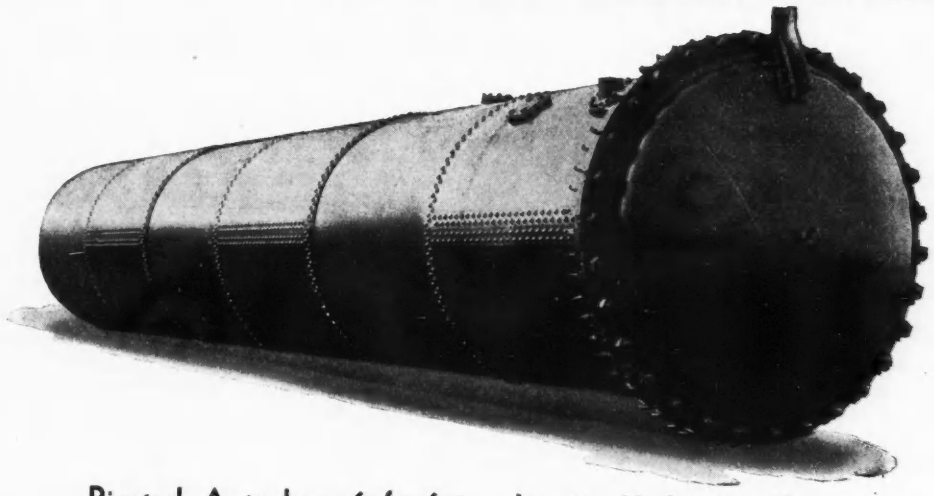

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New Steelmaking Process

Simultaneous Melt of Different Components

ANNOUNCEMENT of their new steelmaking process has been withheld by Allegheny Ludlum Steel Corp. until the product of "Pluramelting" could be announced as immediately available in some commercial forms. In the oil refining industry, pressure vessels made of "Pluramelt" have been in actual service for over two years, according to a report in *Chemical Industries*, 1940, *46*, 5, p. 563.

The chemical industry, the petroleum industry, the food and beverage industry, and the paper industry all use vessels that require strength against the pressures carried and resistance to corrosion. High pressure sometimes demands wall thicknesses of two or more inches of steel, yet only the inner surface of this must resist the corrosive contents. It seems extravagant to make a vessel of solid stainless steel when a thin layer of stainless over a plate of medium carbon steel would serve just as well.

To produce stainless clad materials, several firms use the process of heating slabs of the two metals in contact and then rolling or forging the combination. A second method is that of pouring the liquid melt of carbon steel around a solid section of stainless steel. A third method has been to build up a series of thick overlapping beads of stainless steel rod on a carbon steel backing, followed by machining the surface and rolling the combination to finished size—evidently a costly operation for a product likely to contain many imperfections in the weld metal. More success has been achieved by the method of placing a thin sheet of stainless upon a steel plate of proper thickness and then spot welding them together on close centres by electrical resistance methods.

By research and investigation towards the better fulfilment of present-day needs, it was found that ingots produced by all modern steelmaking processes had certain characteristics in common. Each ingot is formed from the freezing of a melt of single composition so that the final ingot is of relatively uniform composition throughout. In properly deoxidised steels, no dependence is placed upon the hot rolling or mechanical working for the bonding or joining of the particles in any portion of the metals. Because of the singleness of composition of ingots thus produced, these processes could be termed "monomelt." In the production of clad materials it was, therefore, essential that both component analyses be, at least in part, molten at the same time, in order to secure absolute metallic continuity. Such a process could evidently be described by the words "plural melting" or simply "pluramelt." This result was accomplished by means of a special type of electric arc melting furnace so designed that the melting operation could be carried on and the final product would be intermelted with any other metal part and allowed to solidify as an inseparable portion of the mass.

"Pluramelt" in its numerous analyses is the product of an electric furnace melting technique, as a result of which all the special composition materials and a small part of the low-cost materials are melted and integrally joined.

Smelting Lead Products

Some New Data from America

A REPORT entitled "Contributions to the Art of Smelting Lead Products" (R.I. 3512), just issued by the Bureau of Mines, United States Department of the Interior, deals largely with the control of the air used in lead blast furnaces. Original data show the effects on smelting lead products when air is supplied to a lead blast furnace under volume control as compared with pressure control. Further information is given on the gases leaving the top of the charge and on the accretions formed on the walls of the blast furnaces at Trail, B.C. Some new facts are included to show the effect of the temperatures at the tuyère zone on the lead content of the slags made.

The following definite conclusions are reported: (1) At the Trail smelter there is a straight-line relationship between the lead content of the slags and the average temperature at the tuyère zone. For every one per cent. lead increase in the slag the average temperature at the tuyère zone decreases approximately 100° C.

(2) By increasing the number of tuyères on a lead blast furnace a better air distribution is obtained, and less free oxygen passes through the charge.

(3) Scrap iron is very effective as a flux for smelting barred-off accretions, as well as in enlarging "blow holes" to such an extent that in some cases the furnace shaft may be made relatively clean.

(4) At the Trail smelter the lead blast furnaces give better recovery of lead bullion per unit of material charged when air is supplied by pressure regulation. As the blast furnace stock column gets tighter, the volume of air going through the charge becomes less and as the charge loosens the volume of air increases. With pressure regulation, the fluctuations in air volume vary with the physical condition of the charge and therefore this method of control makes for a minimum variation of the furnace shaft temperatures. When air is supplied by volume regulation, a definite volume of air must pass through the charge. The passage of a constant volume of air through charges compacted to different degrees makes for a greater variation of furnace shaft temperatures. With such variations more "hot tops" would be expected as well as an increase in the amount of lead volatilised. Less lead per blast furnace charge then would remain in the furnace to be reduced to metal.

ALUMINIUM ALLOY IN THE CHEMICAL INDUSTRY

Aluminium alloys of the magnesium silicide type, containing about 1.25 per cent. magnesium, together with enough silicon to approximate to the compound Mg_2Si (such as the alloy known as 53S in the U.S.A.) are the most recent innovation in aluminium equipment in the American chemical industry. These seem to be the only alloys that can be used in the heat-treated condition in contact with certain chemicals and food products (*e.g.*, beer) without difficulties caused by the action of the alloy on the liquid. A 13-gallon carboy of alloy 53S, according to Francis C. Frary, writing in *Chemical Industries* (1940; *46*, 6, 714-7), is the latest development of this aluminium product in the replacement of glass for the shipment of certain chemicals, which, however, are not specified.

WOLBER VALLEY EXTRACTION CO., LTD., has been formed in Melbourne with a capital of £10,000 in £1 shares to acquire from the Loriforth Syndicate an operating wolfram mine at Moina, Tasmania. The company's plans include the preparation of tungsten powder and the production of beryllium.

(*Continued from p.* 59.)

this country, since platers here are seldom furnished with welding equipment. One of the arts is to see that the scrap is so jointed to the base anode that it represents one plane, and hence efforts are made to weld the thin part of the former to the stem of the latter, so that the scrap is spread out like the branches of a tree. By this means, the reclaimed anode conforms better to the space occupied in the bath by the fresh anode plate.

In actual practice, the plater has to suffer a loss of current, as the uneven surface presented cannot provide the uniform resistance offered by the fresh flat plate, but all the nickel available is consumed and no waste metal produced. The total cost of welding, together with the extra current required for odd-shaped anodes, amounts to a mere fraction of the loss sustained when attempts are made to dispose of old anodes as scrap. When the foregoing work is carried out in a small way, the final product should be hammered flat, so that all protruding sections will at least be in the same plane, but in large nickel-plating factories the whole is simply run through rolls to ensure the desired flatness.

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New Companies Registered

Electrozone, Ltd. (362,329).—Private company. Capital £100 in 100 ordinary shares of £1 each. Manufacturers of and dealers in ozone, ozonators, etc. Subscribers: Reginald R. Bailey and Stanley H. Lunt. Secretary: R. R. Bailey. Registered office: 10 Dale Street, Liverpool.

Cornish Ochre Mines, Ltd. (362,302).—Private company. Capital £100 in 100 shares of £1 each. To extract, blend and smelt minerals and chemicals of all kinds, and to carry on the business of miners, mining engineers, mineral and chemical merchants, grinders and levigators of minerals and chemicals, etc. Subscribers: Alfred Dobson, 26 Highcliffe Gardens, Ilford; Evelyn I. Chant. Solicitors: L. Bingham and Co., 3 Crown Court, Cheapside, E.C.

Wellington Oil Wharves, Ltd. (362,293).—Private company. Capital £100 in 100 shares of £1 each. Dealers in, refiners, blenders, importers and exporters of oils, greases, fats, glycerine, chemicals and other similar and allied substances, etc. Subscribers: John A. Dale, Chas. J. Manning. Secretary: W. G. Canning. Registered office: Wellington Wharf, Blackhorse Road, Deptford, S.E.

Plastic Spray, Ltd. (362,363).—Private company. Capital £500 in 500 shares of £1 each. To acquire patents for any invention or process relating to apparatus for spraying pulverent materials and liquids on to metals and other materials. Subscribers: Arthur Goodin, "Beechwood," Woodside Avenue, Brighton; Clifford J. Clewley. Solicitors: Swann, Hardman and Co., 10 Norfolk Street, W.C.2.

Tar Emulsions, Ltd. (362,448).—Private company. Capital: £100 in 100 shares of £1 each. Manufacturers of and dealers in coal, coke, pitches, tar paints, oils, bitumens, emulsions of tar, bitumen emulsions and coal extracts, etc. Directors: Chas. A. Midgley; Robert S. Moore. Solicitors: Hepworth and Chadwick, 14 Butts Court, Leeds 1. Registered office: 62 Great Horton Road, Bradford.

Pentoxide, Ltd. (362,497). Private company. Capital: £5000 in 5000 shares of £1 each. To process, import, export and deal in ores, concentrates, residues, tailings, metals, alloys, rare earths and mineral substances of all kinds, and to carry on the business of mine and quarry owners and workers, metallurgists, assayers, manufacturing chemists and electrical and general engineers, etc. Subscribers: W. H. White, 15 Bedford Row, W.C.1, solicitor; F. W. Yates. Solicitors: Smiles & Co., 15 Bedford Row, W.C.1.

Bio-Chemical Laboratories, Ltd. (362,588).—Private company. Capital £1000 in 1000 shares of £1 each. Manufacturers of and dealers in chemicals, gases, drugs, etc. Directors: Charles P. Whitehead, Sidney F. Aspinall, Basil G. Palmer. Registered office: 123 Cannon Street, E.C.4.

Hylab Laboratories, Ltd. (362,579).—Private company. Capital £100 in 100 shares of £1 each. Analytical and consulting chemists: to undertake analytical and research work, etc. Subscribers: Rose Roth, 6 Woodside, London, N.W.11; Fanny Read. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, W.C.2.

Safeflass Products Company, Ltd. (362,341).—Private company. Capital £500 in 500 shares of £1 each. Manufacturers of and dealers in chemical productions and all allied products thereof. Directors: Albert C. R. Greene, "Wood End," Woodhall Drive, Pinner, Harry Davis and Herbert J. Waller. Secretary: A. W. Dann.

E. W. Mann, Ltd. (362,392). Private company. Capital: £1000 in 1000 ordinary shares of £1 each. To acquire the business of a scientific instrument maker, including the manufacturing of fine chemical balances for laboratory, hospital, works and school use and manufacture of other types of balances to specification carried on by Mrs. Mary E. Mahn at 61 Farringdon Road, E.C., as "E. W. Mann." Directors: Mrs. Mary E. Mahn (chairman and permanent director); Mrs. Ellen E. Pritchard and James R. Manning. Registered office: 61 Farringdon Road, E.C.1.

Company News

British Burmah Petroleum report net profits of £123,172 for the year to January 31 last in contrast with £78,792 for the previous 18 months, and £49,756 was brought in. Proposed dividend 6¼ per cent., the first since 5 5-24 per cent., paid for 1930-31.

Chemical Trade Inquiries

Canada.—A well-established firm of export brokers and merchants at Vancouver wishes to obtain the representation of United Kingdom exporters of oils and chemicals. (Ref. No. 452.)

Iraq.—An agent established at Bagdad wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals (fine and industrial) for Iraq. (Ref. No. 447.)

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